Note on Vertical Test Results of Cavity TE1ACC003

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Cavity TE1ACC003 is a single-cell Tesla-shape cavity manufactured by ACCEL. The cavity had never been processed or tested before arrival at FNAL. The cavity was optically inspected (interior) after arrival at FNAL, and then transported to ANL where it underwent EP, HPR, assembly, evacuation, and leak check using the latest procedures. It also underwent the standard 48hour 120° C bakeout cycle at the FNAL A0 facility. It was then transported back to FNAL, to the VCTF at IB1, where it was mounted on the test stand, connected to the pumping system, and instrumented with the prototype single-cell diode thermometry system.

The cavity was cooled down to 2.00K so that CW measurements of Q_0 vs E could be performed Since this cavity was part of a two-single-cell test configuration along with cavity TE1AES004, Q_0 vs T data were not taken in order to take advantage of the efficiency provided by testing two cavities in a single cooldown.

The cavity's field probe was calibrated at field levels of about 5MV/m, and yielded a value of $3.03 \pm 0.06 \times 10^{12}$ (Q_2). The decay measurements (τ) used to calculate Q_2 were within 3% of each other, and the calculated values of Q_2 were consistent to within 2%. The input coupling was determined to be 6.86×10^{9} (Q_1), and the cavity remained overcoupled throughout the test.

Low field Q_0 was found to be about 2.3×10^{10}, decreasing gradually as field increased. The cavity ultimately reached a gradient of 42.1MV/m with a Q_0 there of 5.6×10^{9} (see Figure 1). The cavity was limited by quench. There were only slight indications of radiation marginally above background at high fields, but not exceeding 1.6×10^{-2} mR/hr (background is typically $1.1 – 1.2 \times 10^{-2}$ mR/hr). At maximum field, P_{input} was ~38.7W, with P_{loss} about 36.9W, with the cavity near critically-coupled (P_{ref} was ~1.74W). The cavity easily met the ILC performance specifications, and was essentially FE and multipacting-free.

During the Q vs E run at 2K, scans of the diode thermometry were performed. Online real-time displays of the temperature data indicated the occurrence of a hot spot during cavity quenches, that was generally correlated with the location of a defect found during optical inspection. Complete analysis and results will be reported elsewhere.

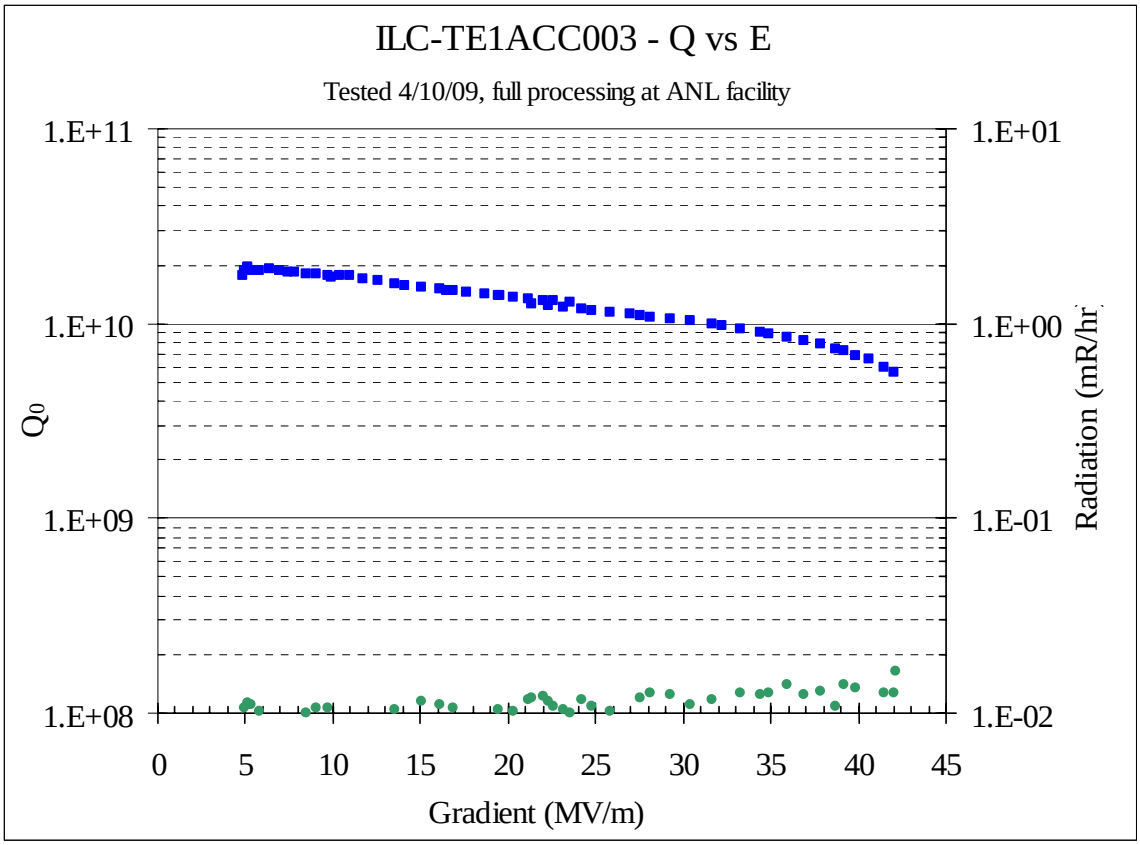

Figure 1.) Q_0 vs E run at 2K